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(71) Applicants:
- **INTEL Corporation**
  Santa Clara, CA 95054 (US)
- **Golonzka, Oleg**
  Beaverton, Oregon 97007 (US)

(72) Inventors:
- **GOLONZKA, Oleg**
  Beaverton, 97007 (US)
- **XU, Guowei**
  Portland, 97229 (US)
- **HUANG, Chiao-Ti**
  Portland, 97229 (US)
- **CHAO, Robin**
  Portland, 97209 (US)
- **CHU, Tao**
  Portland, 97229 (US)
- **ZHANG, Feng**
  Portland, 97229 (US)
- **ZHANG, Yang**
  Rio Rancho, 87124 (US)
- **GUHA, Biswajeet**
  Hillsboro, 97124 (US)

(74) Representative: **2SPL Patentanwälte PartG mbB**
Landaubogen 3
81373 München (DE)

(54) INTEGRATED CIRCUIT DEVICE WITH BACKSIDE FIN TRIM ISOLATION

(57) An IC device includes a backside fin trim isolation (FTI, 150) separating a first transistor (170A) from a second transistor (170B). The FTI may be between a source region of the first transistor and a drain region of the second transistor. The source region of the first transistor and the drain region of the second transistor may be different portions of a semiconductor structure, e.g., a fin or nanoribbon. The IC device may also include a frontside metal layer (125). The semiconductor structure has a first surface and a second surface opposing the first surface. The first surface of the semiconductor structure is closer to the metal layer and may be larger than the second surface of the semiconductor structure. The FTI may has a first surface and a second surface opposing the first surface. The first surface of the FTI is closer to the metal layer but may be smaller than the second surface of the FTI.

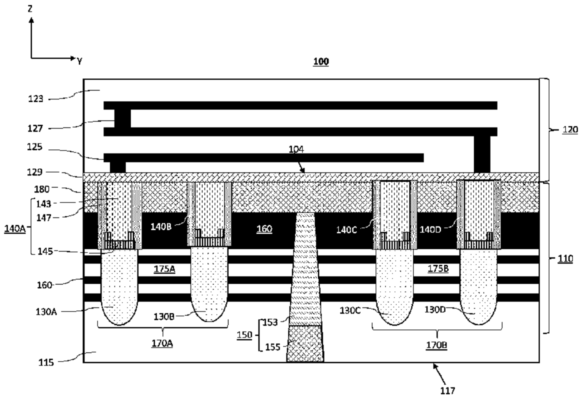

FIG. 1

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EUROPEAN SEARCH REPORT

Application Number
EP 23 22 0088

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	US 2017/117356 A1 (CAROTHERS DAN [US] ET AL) 27 April 2017 (2017-04-27) * paragraphs [0038], [0045]; figure 6D * -----	1-3,5,6	INV. H01L21/8234 H01L27/088 H01L29/06 H01L29/66 H01L29/775
X	JP 2011 035181 A (PANASONIC CORP) 17 February 2011 (2011-02-17) * paragraphs [0040], [0041], [0063]; figures 1, 4(d) * -----	1,4-6	
X	US 2015/325575 A1 (PARK SANG-JINE [KR] ET AL) 12 November 2015 (2015-11-12) * paragraphs [0194], [0207], [0222], [0224]; figures 1, 6, 45c, 47, 58, 59 * -----	1-6	
X	US 2022/399335 A1 (GULER LEONARD P [US] ET AL) 15 December 2022 (2022-12-15) * paragraphs [0037], [0041] - [0046], [0049]; figures 2B, 2C, 3A * -----	1-6	
X	US 2007/132034 A1 (CURELLO GIUSEPPE [US] ET AL) 14 June 2007 (2007-06-14) * paragraph [0038]; figure 5 * -----	1,4-6	TECHNICAL FIELDS SEARCHED (IPC) H01L
A	US 2016/218175 A1 (CAROTHERS DAN [US] ET AL) 28 July 2016 (2016-07-28) * paragraph [0016]; figure 1B * -----	2,3	

~~The present search report has been drawn up for all claims~~

Place of search	Date of completion of the search	Examiner
The Hague	7 June 2024	Seck, Martin

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
Y : particularly relevant if combined with another document of the same category
A : technological background
O : non-written disclosure
P : intermediate document

T : theory or principle underlying the invention
E : earlier patent document, but published on, or after the filing date
D : document cited in the application
L : document cited for other reasons
....
& : member of the same patent family, corresponding document

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CLAIMS INCURRING FEES

The present European patent application comprised at the time of filing claims for which payment was due.

☐ Only part of the claims have been paid within the prescribed time limit. The present European search report has been drawn up for those claims for which no payment was due and for those claims for which claims fees have been paid, namely claim(s):

☐ No claims fees have been paid within the prescribed time limit. The present European search report has been drawn up for those claims for which no payment was due.

LACK OF UNITY OF INVENTION

The Search Division considers that the present European patent application does not comply with the requirements of unity of invention and relates to several inventions or groups of inventions, namely:

see sheet B

☐ All further search fees have been paid within the fixed time limit. The present European search report has been drawn up for all claims.

☐ As all searchable claims could be searched without effort justifying an additional fee, the Search Division did not invite payment of any additional fee.

☐ Only part of the further search fees have been paid within the fixed time limit. The present European search report has been drawn up for those parts of the European patent application which relate to the inventions in respect of which search fees have been paid, namely claims:

☒ None of the further search fees have been paid within the fixed time limit. The present European search report has been drawn up for those parts of the European patent application which relate to the invention first mentioned in the claims, namely claims:

1-6

☐ The present supplementary European search report has been drawn up for those parts of the European patent application which relate to the invention first mentioned in the claims (Rule 164 (1) EPC).

LACK OF UNITY OF INVENTION
SHEET B

Application Number
EP 23 22 0088

The Search Division considers that the present European patent application does not comply with the requirements of unity of invention and relates to several inventions or groups of inventions, namely:

1. claims: 1-6

IC device with reverse tapered dielectric structure between source/drain regions and optionally with tapered semiconductor structure comprising the source/drain regions

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2. claims: 7-11

IC device with deep isolation structure having a bottom surface closer to the frontside than to the backside of the substrate

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3. claims: 12-15

A method comprising forming an IC device, comprising forming different dielectric materials in a recess

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ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO.

EP 23 22 0088

07-06-2024

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